CLAIMS

1. An pose estimation system for performing object pose estimation by comparing an input image with a three-dimensional object model, the pose estimation system comprising:

an pose candidate decision unit for generating at least one pose candidate;

a comparison image generation unit for generating, according to the generated pose candidate, a plurality of comparison images close to the input image, while projecting the three-dimensional object model to a two-dimensional image;

a first sharpness extraction unit for extracting a first sharpness amount reflecting the sharpness from each of the plurality of comparison images;

a weighted difference calculator for calculating a plurality of weighted differences by weighting the first sharpness amount to the difference between the input image and each of the comparison images; and

a determination unit for selecting a comparison image having the smallest weighted difference among the plurality of weighted differences and estimating an optimal pose based on the selected comparison image.

2. The pose estimation system according to Claim 1, further comprising:

a second sharpness extraction unit for extracting a second sharpness amount reflecting the sharpness from the input image,

wherein the weighted difference calculator calculates a plurality of weighted differences by weighting the difference between the second sharpness amount of the input image and the first sharpness amount of each of the comparison images to the difference between the input image and the

comparison image.

3. The pose estimation system according to Claim 1, wherein the weight becomes higher as the sharpness of the image becomes higher in the weighted difference calculation.

4. The pose estimation system according to Claim 2, wherein the first and second sharpness amounts are defined by a ratio of a number of pixels whose edge intensity is a threshold value or higher to the total number of pixels, a range of brightness values, dispersion of brightness values, or a number of characteristic points.

5. The pose estimation system according to Claim 2, wherein the first and second sharpness amounts are defined by an edge image or a characteristic point.

6. An pose estimation and comparison system employing the pose estimation system according to Claim 1, wherein the determination unit further performs object comparison by comparing the minimum weighted difference of the estimated optimal pose with a predetermined threshold value.

7. An pose estimation and comparison system employing the pose estimation system according to Claim 2, wherein the determination unit further performs object comparison by comparing the minimum weighted difference of the estimated optimal pose with a predetermined threshold value.

8. The pose estimation and comparison system according to Claim 6, wherein the weight becomes higher as the sharpness of the image

becomes higher in the weighted difference calculation.

9. The pose estimation and comparison system according to Claim 7, wherein the first and second sharpness amounts are defined by a ratio of a number of pixels whose edge intensity is a threshold value or higher to the total number of pixels, a range of brightness values, dispersion of brightness values, or a number of characteristic points.

10. The pose estimation and comparison system according to Claim 7, wherein the first and second sharpness amounts are defined by an edge image or a characteristic point.

11. A comparison system for performing object comparison by comparing an input image with an object model, comprising:

a comparison image generation unit for generating a plurality of comparison images close to the input image from the object model;

a first sharpness extraction unit for extracting a first sharpness amount reflecting the sharpness from each of the plurality of comparison images;

a weighted difference calculator for calculating a plurality of weighted differences by weighting the first sharpness amount to the difference between the input image and each of the comparison images; and

a determination unit for performing object comparison by comparing the calculated plurality of weighted differences with a preset threshold value.

12. The comparison system according to Claim 11, further comprising:

a second sharpness extraction unit for extracting a second sharpness amount reflecting the sharpness from the input image;

wherein the weighted difference calculator calculates a plurality of weighted differences by weighting the difference between the second sharpness amount of the input image and the first sharpness amount of each of the comparison images to the difference between the input image and the comparison images.

13. The comparison system according to Claim 11, wherein the weight becomes higher as the sharpness of the image becomes higher in the weighted difference calculation.

14. The comparison system according to Claim 12, wherein the first and second sharpness amounts are defined by a ratio of a number of pixels whose edge intensity is a threshold value or higher to the total number of pixels, a range of brightness values, dispersion of brightness values, or a number of characteristic points.

15. The comparison system according to Claim 12, wherein the first and second sharpness amounts are defined by an edge image or a characteristic point.

16. An pose estimation method for performing object pose estimation by comparing an input image with a three-dimensional object model, the method comprising:

generating at least one pose candidate;

generating, according to the pose candidate, a plurality of comparison images close to the input image, while projecting the three-dimensional object model to a two-dimensional image;

extracting a first sharpness amount reflecting the sharpness from each

of the plurality of comparison images; and

calculating a plurality of weighted differences by weighting the first sharpness amount to the difference between the input image and each of the comparison images.

17. The pose estimation method according to Claim 16, further comprising:

extracting a second sharpness amount reflecting the sharpness from the input image,

wherein a plurality of weighted differences are calculated by weighting the difference between the second sharpness amount of the input image and the first sharpness amount of each of the comparison images to the difference between the input image and the comparison image in the calculation of the weighted differences.

18. An pose estimation and comparison method employing the pose estimation method according to Claim 16, further comprising:

selecting a comparison image having the smallest weighted difference among the plurality of weighted differences; and estimating an optimal pose based on the selected comparison image.

19. An pose estimation and comparison method employing the pose estimation method according to Claim 17, further comprising:

selecting a comparison image having the smallest weighted difference among the plurality of weighted differences; and estimating an optimal pose based on the selected comparison image.

20. An object difference calculation method for comparing an input

image with an object model, comprising:

generating a plurality of comparison images close to the input image based on the object model;

extracting a first sharpness amount reflecting the sharpness from each of the plurality of comparison images; and

calculating a plurality of weighted differences by weighting the first sharpness amount to the difference between the input image and each of the comparison images.

21. The object difference calculation method according to Claim 20, further comprising:

extracting a second sharpness amount reflecting the sharpness from the input image;

wherein a plurality of weighted differences are calculated by weighting the difference between the second sharpness amount of the input image and the first sharpness amount of each of the comparison images to the differences between the input image and the comparison image in the calculation of the weighted differences.

22. An object comparison method employing the object difference calculation method according to Claim 20, further comprising:

performing comparison by comparing the plurality of weighted differences obtained by the calculation.

23. An object comparison method employing the object difference calculation method according to Claim 21, further comprising:

performing comparison by comparing the plurality of weighted differences obtained by the calculation.

24. An pose estimation program causing a computer to execute object pose estimation by comparing an input image with a three-dimensional object model, the object pose estimation comprising:

pose candidate decision processing for generating at least one pose candidate;

comparison image generation processing for generating, according to the generated pose candidate, a plurality of comparison images close to the input image, while projecting the three-dimensional object model to a two-dimensional image;

first sharpness extraction processing for extracting a first sharpness amount reflecting the sharpness from each of the plurality of comparison images;

weighted difference calculation processing for calculating a plurality of weighted differences by weighting the first sharpness amount to the difference between the input image and each of the comparison images; and

pose estimation processing for selecting a comparison image having the smallest weighted difference among the plurality of weighted differences and estimating an optimal pose based on the selected comparison image.

25. The pose estimation program according to Claim 24, the object pose estimation further comprising:

second sharpness extraction processing for extracting a second sharpness amount reflecting the sharpness from the input image,

wherein the weighted difference calculation processing calculates a plurality of weighted differences by weighting the difference between the second sharpness amount of the input image and the first sharpness amount of each of the comparison images to the difference between the input image

and the comparison image.

26. An pose estimation and comparison program employing the pose estimation program according to Claim 24,

wherein object comparison is further performed in the pose estimation processing by comparing the smallest weighted difference of the estimated optimal pose with a predetermined threshold value.

27. An pose estimation and comparison program employing the pose estimation program according to Claim 25,

wherein object comparison is further performed in the pose estimation processing by comparing the smallest weighted difference of the estimated optimal pose with a predetermined threshold value.

28. A comparison program causing a computer to execute object comparison by comparing an input image with an object model, the object comparison comprising:

comparison image generation processing for generating a plurality of comparison images close to the input image from the object model;

first sharpness extraction processing for extracting a first sharpness amount reflecting the sharpness from each of the plurality of comparison images;

weighted difference calculation processing for calculating a plurality of weighted differences by weighting the first sharpness amount to the difference between the input image and each of the comparison images; and

comparison processing for performing comparison by comparing the plurality of weighted differences obtained by the calculation.

29. The comparison program according to Claim 28, the object comparison further comprising:

second sharpness extracting processing for extracting a second sharpness amount reflecting the sharpness from the input image,

wherein the weighted difference calculation processing calculates a plurality of weighted differences by weighting the difference between the second sharpness amount of the input image and the first sharpness amount of each the comparison images to the difference between the input image and the comparison images.